

PATENT ABSTRACTS OF JAPAN

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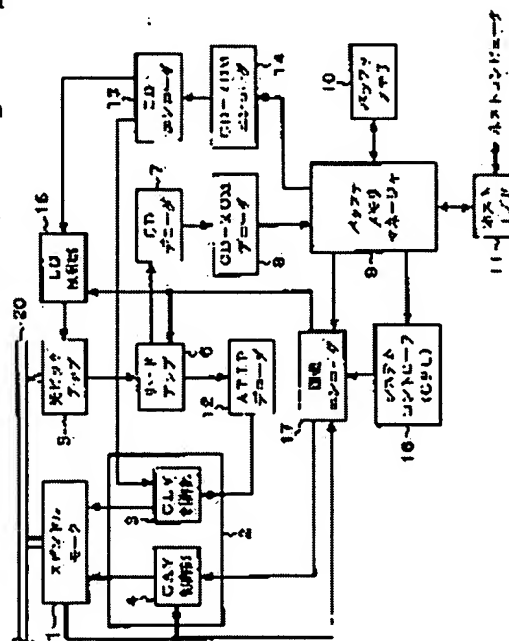
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(54) OPTICAL DISK RECORDER

(57)Abstract:

PROBLEM TO BE SOLVED: To clearly record a visualized picture so as not to lower the recording quality of data already recorded on a recordable optical disk.

SOLUTION: Picture encode data consisting of a pit and a space longer than reproducible data are produced by a picture encoder 17 on the basis of picture data, and the emission and the stop of a laser beam by an optical pickup 5 are controlled with an LD control part 15 on the basis of the picture encode data, then the long pit and space are formed by a CPU 16 at places on the data recorded surface, where the reproducible data are not recorded yet, so that the visible picture visualized by the difference of the light reflectance between these long pit and space is recorded.



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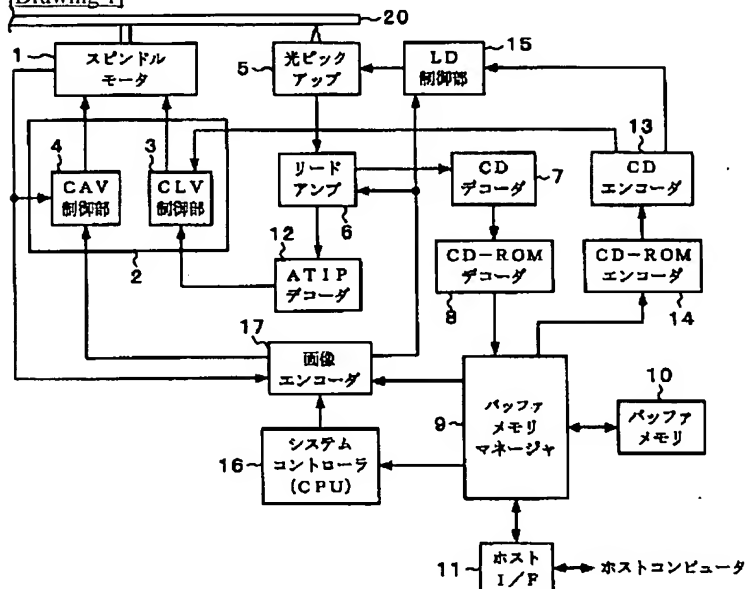
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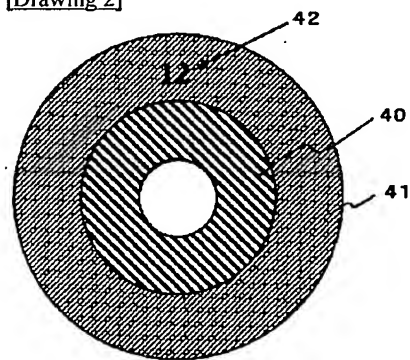
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DRAWINGS

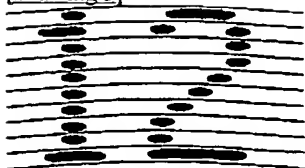
[Drawing 1]



[Drawing 2]



[Drawing 3]



[Drawing 4]



[Drawing 5]



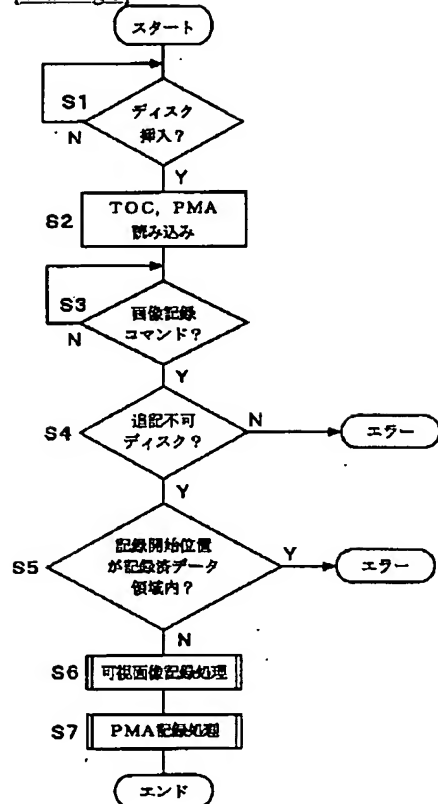
画面1

画面2

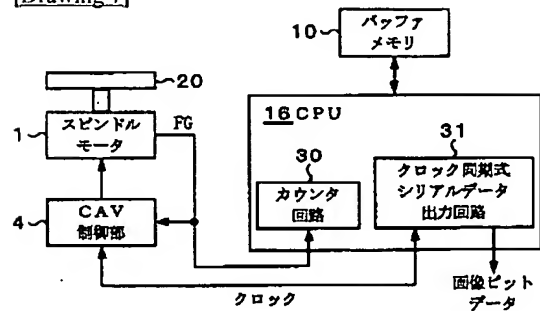
画面3

画面4

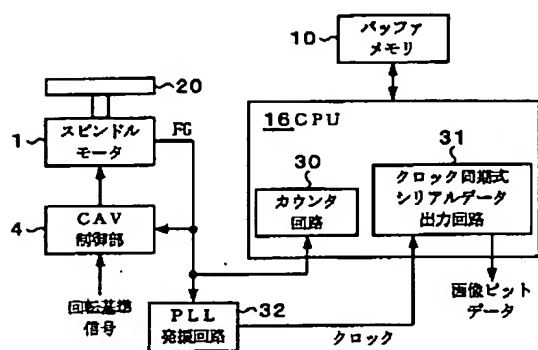
[Drawing 6]



[Drawing 7]



[Drawing 8]



[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the optical disk recording device which draws an alphabetic character and a graphic form to the data-logging side of optical disks, such as CD-R, CD-RW, and DVD, and the optical disk which is not mainly enclosed with a cartridge.

[0002]

[Description of the Prior Art] CD-R represented by the write once optical disk with low-pricing of an optical disk recording apparatus and media has spread quickly. That is because CD-R can be reproduced with the CD-ROM drive which now is preinstalled in the personal computer (PC), so it is very convenient for recording data with much unrecordable capacity on a floppy (trademark) disk, and making it move to the exterior. Moreover, it is because the original music CD can be created for a music lover if CD-R is used, so it is very attractive media. Since it was enabled for the drawing speed of data to become a high speed and, especially as for the latest CD-R drive, to create a lot of data-logging finishing CD-Rs for a short time, user-friendliness also becomes good, and that of the need of CD-R is skyrocketing, and it is not new to own hundreds of CD-Rs by one person.

[0003] Thus, when it comes to own a lot of CD-Rs, discernment and arrangement of each disk are needed. With the stamp CD which is established data-logging finishing media, printing has been performed to the label side and distinction of the disk and a judgment of the contents of record can be made easily. For example, the optical disk which formed in JP,5-6576,A the mark which can be viewed by the existence of a pit, and its manufacture approach are indicated. Moreover, it is indicated about the optical disk in which the mark which can be viewed by making large pit width of face of specific pit length among refreshable data pits at JP,11-213455,A was formed. However, since a user writes in data, CD-R cannot judge distinction or the contents of record of the disk by viewing only by a label side being solid color, or the brand design only being printed, and merely writing in data.

[0004] So, at CD-R, a user has usually entered the disk title in the label side in handwriting with the oily pen, after writing in data.

However, in this case, an oily pen is required or the badness of the appearance by handwriting becomes a fault. Moreover, there are an approach of printing and sticking on the label only for CD-Rs and the approach of printing directly by the exclusive printer to CD-R which can be printed, according to these approaches, a beautiful full color label can create, but the cost of a label attaches the former highly, there is a problem that where of the trouble of the data loss by the recording layer of data separating with a label occurs, printer bull media and an exclusive printer become expensive, and the latter is not an easy and cheap approach.

[0005] From such a background, the method of filling in a title and the contents of data to an optical disk is searched for, without a user using a pen and a printer. CD-R records refreshable data by making record film and a substrate deform by the strong laser beam, and forming a pit. And the recorded data read a weak laser beam by change of the reflected light which hits and returns. Although change of the reflected light reacts on the wavelength of a laser beam strongly, since the reflection factor in the light also changes with pits, a color can change and be seen [change] in the part which is not recorded as the part on which data are recorded. In the case of Stamp CD, compared with contrast the image formed with the stamp on the recording surface being deficient in change of a reflection factor, and practical not being acquired, change of the color of the data-logging part of CD-R can acquire sufficient contrast to view.

[0006] That is, if images, such as an alphabetic character and a mark, are recorded by the pit by making the truck of the data-logging side of CD-R into the scanning line, it will become the alphabetic character and mark which can be viewed. Then, the optical disk recording apparatus (for example, refer to JP,11-134648,A) which prevents reduction of record data volume, and the optical disk recording apparatus (for example, refer to JP,11-134648,A) which forms a visible image in the data-logging side of a recordable optical disk by changing pit width of face by the data which changed rectangular coordinates into the polar coordinate were proposed by making the recorded data of the data-logging side of a recordable optical disk overlap, and forming a visible image conventionally.

[0007]

[Problem(s) to be Solved by the Invention] However, though pit width of face was changed in the above conventional optical disk recording apparatus by the data which changed rectangular coordinates into the polar coordinate after overlapping the visible image to the recorded data on an optical disk, there was a problem that it was also difficult to acquire contrast with required for about [being difficult] and viewing maintaining the record quality of recorded data. It is made in order that this invention may solve the above-mentioned technical problem, and it aims at enabling it to record vividly the image which can be viewed as not reducing record quality of the data already recorded on the recordable optical disk.

[0008]

[Means for Solving the Problem] In the optical disk recording device which records refreshable data by irradiating the laser beam which made it generate from an optical pickup, and forming a pit and a tooth space in the data-logging side of an exchangeable optical disk in order that this invention may attain the above-mentioned purpose image data -- being based -- the above -- with an image encoding data generation means to generate the image encoding data which consist of a pit and a tooth space longer than refreshable data Laser beam exposure / halt control means which controls the exposure of the laser beam by the above-mentioned optical pickup, and a halt based on the image encoding data generated by the image encoding data generation means, A long pit and a long tooth space are made to form. the above of the above-mentioned data-logging side -- the exposure of a laser beam and control of a halt according to the above-mentioned laser beam exposure / halt control means to the location which is not recorded [refreshable / of data] -- the above -- The visible image

record control means on which the visible image whose viewing is attained by the difference in the reflection factor of the light of the long pit and long tooth space is made to record is established.

[0009] moreover, the quantity of light of the above-mentioned laser beam which changes during record of the above-mentioned visible image in the above optical disk recording devices -- responding -- the amplification factor of the error signal for serves of the above-mentioned optical pickup -- adjusting -- the above -- it is good to establish the optical pickup control means which performs servo control of the above-mentioned optical pickup stably at the time of formation with a long pit and a long tooth space. Furthermore, in the above optical disk recording apparatus, it is good at the time of record of the above-mentioned visible image to establish a constant angular velocity roll control means to rotate the above-mentioned optical disk by the constant angular velocity so that the truck for 1 round of the above-mentioned optical disk may be equivalent to the horizontal scanning line of rectangular coordinates.

[0010] moreover, control of the exposure quantity of light of the laser beam by the laser beam exposure quantity of light control means to which the exposure quantity of light of the laser beam by the above-mentioned optical pickup is gradually changed in the above optical disk recording devices, and the above-mentioned laser beam exposure quantity of light control means -- the above -- it is good to establish the shade image recording control means which the width of face and the depth of a long pit are changed, and attaches a shade to the above-mentioned visible image. Furthermore, in the above optical disk recording apparatus, it is good to prepare the shade image recording control means which attaches the shade of a multistage story by the binary recording method in the above-mentioned visible image with a means to form 1 pixel of the above-mentioned image data by two or more trucks, and to express the multiple value of the pixel by the number of a pit truck, and arrangement, and its means.

[0011] moreover, the above optical disk recording apparatus -- setting -- the information on TOC of the above-mentioned optical disk, PMA, or RMA -- being based -- the above of the above-mentioned data-logging side -- a recorded field judging means to judge whether it is the recorded field of refreshable data -- preparing -- the judgment result of the recorded field judging means -- being based -- the above -- it is good to make it make the above-mentioned visible image record on a non-recorded location [data / refreshable]. furthermore, a postscript impossible field judging means are the optical disk which cannot be added and judge the postscript impossible field of the data-logging side in the above optical disk recording apparatus based on the information on TOC of the above-mentioned optical disk, PMA, or RMA -- preparing -- the judgment result of the postscript impossible field judging means -- being based -- the above -- it is good to make it make the above-mentioned visible image record on the above-mentioned postscript impossible field as a non-recorded location [data / refreshable]

[0012] Moreover, in the above optical disk recording apparatus, it is good to establish a means to record the information which shows the record section of the above-mentioned visible image to PMA of the above-mentioned data-logging side, or RMA after record of the above-mentioned visible image. furthermore, the image data in the above optical disk recording apparatus, have CPU which built in the clock synchronous system serial data output circuit, and according to the above-mentioned image encoding data generation means by the firmware of the CPU -- being based -- the above -- it is good to generate the image encoding data which consist of a pit and a tooth space longer than refreshable data.

[0013] Moreover, in the above optical disk recording apparatus, it is good to rotate the above-mentioned optical disk synchronizing with the clock outputted by the above-mentioned clock synchronous system serial data output circuit, and to record the above-mentioned visible image. Furthermore, in the above optical disk recording apparatus, it is good to record the above-mentioned visible image based on the serial data outputted synchronizing with the clock which has a PLL clock output means to output a clock to FG pulse of the spindle motor made to rotate the above-mentioned optical disk, and was outputted by the PLL clock output means.

[0014]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is concretely explained based on a drawing. Drawing 1 is the block diagram showing the configuration of the optical disk recording apparatus which is 1 operation gestalt of this invention. In addition, an arrow head does not show a typical signal or data flow, and does not express all the connection relation of each block. This optical disk recording device is information record processors, such as a CD-R drive realized with the microcomputer which consists of CPU, a ROM, RAM, etc. Optical disks 20 are the recordable media of CD-R etc., and are made to carry out a rotation drive at the rate of predetermined with a spindle motor 1. In a spindle motor 1, the roll control of the linear velocity is carried out by the Motor Driver servo processing section 2 so that regularity or angular velocity may become fixed. This linear velocity or angular velocity can be changed gradually.

[0015] An optical pickup 5 is a unit for recording refreshable data or reading the recorded refreshable data by building in the well-known semiconductor laser which omitted illustration, optical system, the focal actuator, the truck actuator, the photo detector, the position sensor, etc., generating a laser beam, irradiating an optical disk 20, and forming a pit and a tooth space in an optical disk 20. Moreover, the optical pickup 5 is movable to the data-logging side of an optical disk 20 by the well-known seeking motor which similarly omitted illustration. These focus actuator, a truck actuator, and a seeking motor are controlled so that the laser spot of a laser beam is located in the location (a logged point or playback part) of the purpose of a data-logging side by processing of the Motor Driver servo processing section 2 based on the signal acquired from the photo detector and the position sensor.

[0016] After the regenerative signal which was acquired by the optical pickup 5 in the data lead from a data-logging side is amplified and made binary with the lead amplifier 6, it is inputted into the CD decoder 7 and receives processing of a day interleave and an error correction. Then, this data receives processing of an error correction, in order to be inputted into the CD-ROM decoder 8 and to raise the dependability of data further. Then, this data is once stored in buffer memory (buffer RAM) 10 by the buffer memory manager 9, and is sent at a stretch to a host computer through a host interface (I/F) 11 in the place which gathered as sector data.

[0017] In the case of the data light to a data-logging side, the data sent from the host computer through host I/F 11 are once stored in buffer memory 10 by the buffer memory manager 9. Although a light is started in the place where a certain amount of quantity of data accumulated in buffer memory 10, you have to write in a laser spot before that and have to make it located in an initiation point. This point is called for based on the wobble signal beforehand miniced by the optical disk 20 by meandering of a truck. The absolute time information called ATIP is included in the wobble signal, and this absolute time information can be taken out by the ATIP decoder 12.

[0018] Moreover, the synchronizing signal which the ATIP decoder 12 generates is inputted into the CD encoder 13, and makes the beginning of the data in an exact location possible. Addition and an interleave of an error correction code are performed by the CD-ROM encoder 14 and the CD encoder 13, the data of buffer memory 10 serve as a signal modulated by EFM for record from the CD encoder 13, and are outputted, and a pit is recorded on an optical disk 20 by the laser beam controlled by the LD control section 15 or the optical pickup 5. The LD control section 15 makes a laser beam emit light by light power according to EFM for record, and is controlling the condition of

luminescence continuously to be able to perform suitable record playback.

[0019] Next, record processing of the visible image concerning this invention is explained. The image data sent from the host computer is once accumulated in buffer memory 10 through host I/F11 and the buffer memory manager 9. If it finishes receiving all image data, record of a visible image will be started in the place which received the image data of the constant rate set up beforehand, but if it has finished receiving image data, reception of the image data from a host computer is continued also during record of a visible image. A system controller (CPU) 16 starts a spindle motor 1 and the image encoder 17, and an optical pickup 5 is moved to the location (logged point of a visible image) specified from the host computer. According to the synchronizing signal with which the Motor Driver servo processing section 2 is outputted from the ATIP decoder 12, the CLV control section 3 rotates a spindle motor 1 by the constant linear velocity.

[0020] The image encoder 17 generates the image encoding data which consist of a pit and a tooth space longer than refreshable data based on image data, according to the pit signal of image encoding data, the laser beam of predetermined light power is irradiated to an optical disk 20, or the LD control section 15 suspends it to it. In this way, a long pit and a long tooth space are made to form by the exposure of a laser beam, and control of a halt, and the visible image whose viewing is attained is recorded on the field whose refreshable data of the data-logging side of an optical disk 20 are not recorded with a system controller 16 by the difference in the reflection factor of the light of the long pit and long tooth space. Since the reflection factor of the part will change if a physical pit is formed in the data-logging side of an optical disk 20, images constituted by the set of a pit, such as an alphabetic character and a mark, are recordable as a clear visible image.

[0021] Namely, the function of an image encoding data generation means to generate the image encoding data with which the above-mentioned image encoder 17 consists of a pit and a tooth space longer than refreshable data based on image data. The function of laser beam exposure / halt control means which controls the exposure and halt of a laser beam by the optical pickup based on the image encoding data by which the above-mentioned LD control section 15 was generated with the image encoding data generation means. In the location which is not recorded [of said refreshable data of a data-logging side], the above-mentioned system controller 16 grade A long pit and a long tooth space are made to form by the exposure of a laser beam and the control of a halt by laser beam exposure / halt control means, and the function of the visible image record control means on which the visible image whose viewing is attained is made to record is achieved, respectively by the difference in the reflection factor of the light of the long pit and long tooth space.

[0022] Here, when recording an image for a truck as a horizontal scanning line of rectangular coordinates, physical physical relationship with an adjoining truck is important. ATIP of CD-R is recorded by CLV, and when recording an image on the basis of this signal, processing of complicated coordinate count and amendment is needed. Although the load of an optical disk recording apparatus will become light if a host computer performs this processing, the amendment more than record resolution is impossible, and has a possibility of causing increase of image data, and deterioration of image quality as a result. Then, it is good to record a visible image by CAV control for solving these problems simply.

[0023] First, a system controller (CPU) 16 starts a spindle motor 1 and the image encoder 17, and an optical pickup 5 is moved to the location (logged point of a visible image) specified from the host computer. According to the reference signal with which the Motor Driver servo processing section 2 is outputted from the image encoder 17, the CAV control section 4 rotates a spindle motor 1 by the constant angular velocity. The CAV control section 4 compares the reference signal outputted from the image encoder 17 with FG signal outputted from a spindle motor 1, and performs the exact roll control which synchronized with image data. That is, the above-mentioned CAV control section 4 and the image encoder 17 achieve the function of a constant angular velocity roll control means to rotate an optical disk by the constant angular velocity so that the truck for 1 round of an optical disk may be equivalent to the horizontal scanning line of rectangular coordinates, at the time of record of a visible image.

[0024] The image encoder 17 generates the image encoding data which consist of a pit and a tooth space longer than refreshable data based on image data, and using FG signal of a spindle motor 1, a synchronization is taken and it is sent to the LD control section 15 and the lead amplifier 6 so that the start location of the data for the image of one line may serve as the always same angle of rotation. Since this synchronous engine performance has big effect on image quality, it is still better. [of making / many / FG pulse or preparing the index pulse circuit of dedication] Moreover, the specification of semicircle extent instead of an one-line round is sufficient as image data. The LD control section 15 follows the pit signal of image encoding data, and irradiates or stops the laser beam of predetermined light power to an optical disk 20.

[0025] In this way, a long pit and a long tooth space are made to form by the exposure of a laser beam, and control of a halt, and the visible image whose viewing is attained is made to record on the location which is not recorded [of said refreshable data of the data-logging side of an optical disk 20] with a system controller 16 by the difference in the reflection factor of the light of the long pit and long tooth space. Since the reflection factor of the part will change if a physical pit is formed in the data-logging side of an optical disk 20, a clear visible image is recordable with the set of a pit. thus -- without a user uses a pen and a printer -- an optical disk -- a disk title and the contents of a disk -- viewing -- possible -- recordable -- in addition -- and a data quality [finishing / record] is not reduced

[0026] Here, from the slot of the optical disk called a truck by the truck servo, a laser beam is controlled not to overflow and is controlled to make it condense by the focus servo and to make a spot to record film. Since an error signal required for servo control is generated from the reflected light of a laser beam, if the outgoing radiation quantity of light of a laser beam changes, the amplitude of an error signal will change and it will affect servo control. Since this problem is coped with, the outgoing radiation quantity of light of a laser beam is being reproduced under the record which changes a lot, and the amplification factor of an error signal is changed. If the inside of data logging is seen finely, the quantity of light will change a lot also in a pit and a tooth space, but since the period is fully short compared with a servo band, it does not become a not much big problem.

[0027] However, in record of a visible image, it is also considered that a pit continues all the time, and if it does not change during the record, there is a possibility that servo control may become impossible normally. Then, it is good to adjust the amplification degree of an error signal required for the servo control of an actuator according to the increment in the amount of reflected lights according pit data to light power with delivery and a system controller 16 also in the lead amplifier 6. That is, a system controller 16 achieves the function of an optical pickup control means to adjust the amplification factor of the error signal for servoes of an optical pickup 5 according to the quantity of light of the laser beam which changes during record of a visible image, and to perform servo control of an optical pickup 5 stably at the time of formation with a long pit and a long tooth space. Thus, the record precision of the pit which the servo control at the time of recording a visible image on an optical disk is stabilized, and forms a visible image can be raised.

[0028] Drawing 2 is the image Fig. of the visible image formed in the recording surface of an optical disk. Drawing 3 is the image Fig. expanding and showing the visible image part. As shown in drawing 2, since data are recorded from inner circumference in the case of CD-R, an inner circumference side is the record section 40 which recorded refreshable data, and a periphery side becomes the non-record

section 41. A visible image 42 is recorded on the part of this non-record section 41. In this case, although it can hardly perform recording a visible image if data refreshable to the limit of the storage capacity of CD-R are recorded for data, data are not not much usually recorded on a data-logging flat-tapped cup, and only a few writes in data conversely in many cases. Moreover, it is also possible to reduce the record amount of data for image recording. A visible image is recorded by the scanning-line method, and the truck for disk 1 round becomes the scanning line. Although the scanning line will deform when it draws the bit data of rectangular coordinates as it is since the length differs on inner circumference and a periphery and it draws an arc, an alphabetic character etc. can fully be deciphered.

[0029] Since it becomes difficult for a track pitch to decipher the figure drawn by ten trucks with 1.6 micrometers since it was narrow with the naked eye when it is CD-R, although the example which draws 12 on drawing 3 in a pit is shown, it is good to make it form by ten or more trucks. That is, a visible image can be formed if the bit data of a rectangular coordinate system are recorded as it is. thus -- for example, a possibility may reduce the record quality of data, such as a program, a document, and music, which can record a visible image on a different location from the record data of the data-logging side of an optical disk by forming the pit train of a visible image in the field of a part in which it remained after writing in data, and has already been recorded -- or the part in which the data-logging side remained can be used without futility. Moreover, since the logged point of data and the logged point of a visible image have been independent, respectively, a visible image can be recorded after data logging, or a visible image can also be recorded on the optical disk which recorded data with other optical disk recording apparatus, and user-friendliness also has the advantage of being good.

[0030] Next, the digital data of CD has a method of performing hologram processing in a label side, in order to prove the original nature of an optical disk, since a duplicate is easy. Although the visible image recorded on the data-logging side as mentioned above cannot be read as data and brings about the same effectiveness as a hologram, considering the purpose which makes reproduction difficult, it is necessary to use it as a more complicated visible image. Then, in order to be able to carry out the gradation expression of the visible image, it is good to change the width of face and the depth of each pit which constitutes a visible image. If the light power of a laser beam is changed to an optical pickup 5, the width of face and the depth of each pit are changeable into it. Therefore, since a reflection factor changes in the width of face and the depth of a pit, respectively, a shade can be attached and recorded on a visible image by adjusting the light power of the laser beam of an optical pickup 5 by the LD control section 15. First, based on image data, an analog or digital multiple-value pit data is outputted from the image encoder 17. The LD control section 15 carries out control which makes [many] the exposure quantity of light of the light power based on the multiple-value pit data to an optical pickup 5, or is lessened. An optical pickup 5 changes the quantity of light of a laser beam by change of the exposure quantity of light, irradiates an optical disk 20, and records the visible image which changed the width of face and the depth of a pit on the data-logging side of an optical disk 20.

[0031] That is, the function of the above-mentioned LD control section 15, the laser beam exposure quantity of light control means to which the image encoder 17 changes gradually the exposure quantity of light of the laser beam by the optical pickup 5 at the time of record of the visible image to a data-logging side, and the shade image recording control means which the width of face and the depth of a long pit are changed, and attaches a shade to a visible image by control of the exposure quantity of light of the laser beam by the laser beam exposure quantity of light control means is achieved. Drawing 4 is the image Fig. expanding and showing the visible image part which attached the shade. The depth is made deep narrowly [width of face / of each pit which constitutes "1" of a figure "12"], and the depth is made shallow widely [width of face / of each pit which constitutes "2"]. Thus, the complicated visible image which attached the shade by the multiple-value image can be recorded, and duplicate distinction effect is demonstrated.

[0032] Next, in above-mentioned processing, the laser control for changing the width of face and the depth of a pit must stop having to add a new circuit to the conventional optical disk recording device, and causes a cost rise. The track pitch of CD-R has very high horizontal resolution at about 1.6 micrometers. Then, 1 pixel will come out enough, if there are no less than 100 micrometers as pixel resolution with consisting of 62 lines, and a new circuit will become unnecessary if gradation is given to a pixel by the number of these lines, and arrangement from a certain thing. That is, at the time of record of the above-mentioned visible image, as 1 pixel of image data is formed by two or more trucks and the multiple value of the pixel is formed by the number of a pit truck, and arrangement, the shade of a multistage story is attached and recorded by the binary recording method.

[0033] That is, the above-mentioned LD control section 15 and the image encoder 17 form 1 pixel of image data by two or more trucks, and achieve the function of a means to express the multiple value of the pixel by the number of a pit truck, and arrangement, and the shade image recording control means which attaches the shade of a multistage story to a visible image by the binary recording method with the means. In this way, as mentioned above, although a circuit becomes complicated, multiple-value-izing of pit data and the cascade control of light power can form the complicated visible image by the multiple-value image, without carrying out a circuit addition to a binary picture formation circuit, if it expresses the shade of a visible image by the consistency of a pit when 1 dot as practical image resolution is constituted from ten truck numbers with 1.6 micrometers, since the track pitch of CD-R is high-density. Drawing 5 is drawing showing each image when expressing pixels 1-4 for the visible image constituted from ten trucks by four steps of concentration.

[0034] Next, writing and crushing refreshable data by record of a visible image must avoid absolutely. Since an optical disk recording apparatus can judge how far data are recorded from TOC and PMA of a data-logging side of an optical disk 20, the visible image record section specified from the host computer using the information judges and writes having not lapped with a refreshable data area, and it prevents crushing. Even if it records an image on the above non-record sections, there is a possibility that data may be recorded afterwards by the part which recorded the visible image, and it becomes impossible moreover, to read the data naturally in the case of the disk which can be added. Then, CD-R is good to limit to the optical disk which cannot add record of a visible image, in order to avoid the above problems using the ability to choose whether whether a postscript is made possible makes it impossible, when a session is closed.

[0035] In the case of the usual data, truck information is written in PMA, but if the record section of a visible image is also written in PMA as a truck, double record and a postscript of a visible image can be prevented easily, and user-friendliness will become good very much further again. For that purpose, it is good after image recording to write the information on the record section of a visible image in an optical disk 20 (for example, PMA).

[0036] Drawing 6 is claim 6 of this invention thru/or the flow chart Fig. of the visible image record processing concerning 8. If this processing judges whether optical disks, such as CD-R, were inserted to an optical disk recording apparatus and inserted in it at step ("S" shows among drawing) 1, it will read TOC and PMA from the data-logging side of that optical disk at step 2. It judges whether the image recording command came by step 3 from the host computer, and if an image recording command comes, it will judge whether it is the optical disk which can be added from the information on TOC already read at step 4. If it is the optical disk which can be added, this processing will be ended in an error, and if it is an optical disk [that a postscript cannot be added], it will progress to step 5.

[0037] The image recording starting position specified by the block address from the host computer based on the information on TOC and

PMA at step 5 judges whether it is the inside of a data-logging finishing field. If it is in a data-logging finishing field, this processing will be ended in an error, and if it is outside a data-logging finishing field, visible image record processing will be started at step 6. If visible image record is completed, the recording start location and termination location of a visible image will be calculated at step 7, and the hour entry will be recorded on PMA of an optical disk with the track number following data tracks. Although this image recording termination location is calculated from the number of tracks, the method of reading ATIP immediately after record termination is also considered. That is, the above-mentioned system controller 16 achieves the function of a recorded field judging means to judge whether it is the recorded field of the refreshable data of a data-logging side based on the information on TOC of an optical disk 20, PMA, or RMA, and makes a visible image record on the location which is not recorded [of refreshable data] based on the judgment result.

[0038] Moreover, it is the optical disk which cannot be added, and the function of a postscript impossible field judging means to judge the postscript impossible field of the data-logging side is achieved, and it is made to make a visible image record on a postscript impossible field as a location which is not recorded [of refreshable data] based on the judgment result based on the information on TOC of an optical disk 20, PMA, or RMA. Furthermore, the above-mentioned system controller 16 grade also achieves the function of a means to record the information which shows the record section of a visible image on PMA of a data-logging side, or RMA after record of a visible image.

Thus, the accident which overwrites a visible image at recorded data and disappears data can be prevented. Moreover, the accident which overwrites data at a recorded visible image and disappears data can be prevented. Furthermore, the postscript of a visible image is attained.

[0039] Next, the contents of processing change with the data formats to which encoding processing of image data is sent from a host computer a lot. Although it is easiest for me to have the same pixel data as the record resolution to an optical disk 20 sent, even if it calls it encoding in this case, processing with firmware is [that what is necessary is just to output pixel data serially] fully possible. However, it says from track density, and there are quite many amounts of image data and they are not [processing which outputs 1 bit of data at a time to an I/O Port with firmware] of use for high-speed record.

[0040] However, CPU for almost all inclusion equipments builds in the serial data output circuit, and if this is used, it does not need to add hardware to encoding. Moreover, a visible image cannot be formed if the data and the spindle motor which are outputted from a serial data output circuit do not synchronize. Then, it controls so that FG pulse of a clock and a spindle motor 1 outputted from a clock synchronous system serial data output circuit carries out phase simulation.

[0041] Drawing 7 is the block diagram showing the circuitry concerning claims 9 and 10 of this invention. A visible image can be formed in the data-logging side of an optical disk 20 if pixel data are fundamentally recorded as a pit. Even if it calls it image encoding, if data are sent by making a track pitch into pixel resolution from a host computer, with synchronous processing extent, it will be good and processing will become sufficiently possible by CPU16 of an optical disk recording device. Since it still is not of use to have operated the I/O Port with firmware, as shown in drawing 7, the clock synchronous system serial data output circuit 31 built in CPU16 which is an object for inclusion is used.

[0042] The timing which became the angle of rotation which FG signal of a spindle motor 1 is inputted into the counter circuit 30 of CPU16, and has a spindle motor 1 can be known. This is made into the Rhine data output timing of a visible image, and CPU16 reads image data from buffer memory 10, and sets it to the clock synchronous system serial data output circuit 31. From the clock synchronous system serial data output circuit 31, pit data are outputted and a data clock is outputted to coincidence. The CAV control section 4 makes an output data clock a rotation reference signal, and controls a spindle motor 1 to a constant angular velocity. Thus, it becomes unnecessary to form an image encoder special to an optical disk recording device, and a visible image record function can be offered cheaply. Moreover, the synchronization of data and a rotational frequency can be performed easily.

[0043] Next, the clock of a clock synchronous system serial data output circuit, then the output of the image data which synchronized with rotation are attained in FG pulse of a spindle motor 1. However, there are very few FG pulses of the spindle motor 1 currently used for the optical disk recording device from several shots at one rotation as dozens of shots, and image resolution is widely different. Then, it is good to generate the PLL clock which carried out phase simulation to FG pulse of a spindle motor 1. The pulse number of 1 rotation of a spindle motor 1 is equivalent to image resolution, and this clock can form a visible image easily, if this is inputted as a clock of a clock synchronous system serial data output circuit.

[0044] Drawing 8 is the block diagram showing the circuitry concerning claim 11 of this invention. A spindle motor 1 is controlled by the suitable reference signal instead of an output data clock by the constant angular velocity. Although it is the same as the case of drawing 7 for FG signal of a spindle motor 1 to be inputted into a counter circuit 30, and to be used for the Rhine synchronization, being inputted into the PLL oscillator circuit 32 differ. That is, the function of a PLL clock output means by which the above-mentioned PLL oscillator circuit 32 outputs a clock to FG pulse of the spindle motor made to rotate an optical disk is achieved, and CPU16 records a visible image based on the serial data outputted synchronizing with the clock outputted by the PLL clock output means. The PLL oscillator circuit 32 generates the clock which synchronized with rotation of a spindle motor 1. If it is inputted into the clock synchronous system serial data output circuit 31, using this clock as a data clock, a visible image can be formed like the case where it is shown in drawing 7. Thus, the synchronization of image data and a rotational frequency can be easily performed with a sufficient precision.

[0045]

[Effect of the Invention] As explained above, according to the optical disk recording apparatus of this invention, the image which can be viewed is vividly recordable in not reducing record quality of the data already recorded on the recordable optical disk.

[Translation done.]